

UPGRADE WORKSHOP

Power supply units

If your PC has become unstable or you are planning a major upgrade to your system, you may need to crank up your power supply. Simon Handby explains how to install the right PSU for your needs

A PC's power supply unit (PSU) converts 230-volt mains electricity into the 3.3V, 5V and 12V supplies needed by the components inside your computer. A good PSU can last a long time, but if you're planning any major improvements or a recent upgrade has left your system unstable, you may need a new one.

There are several types of PC power supply and the one you need depends on the internal layout of your computer, which is known as its case form factor. Most desktop computers use an ATX case and so require an ATX power supply; see our Compatibility Checklist below for details.

The amount of power produced by a PSU is measured in watts. A simple PC might run happily with a 300W PSU, but highly specified gaming computers can require 500W or more. You can calculate the maximum power consumption of your system by adding together the power requirements of each component. This information is often printed on product labels or specification sheets, but it can be hard to find.

Alternatively, your motherboard manual may recommend the amount of power, in watts, that a typical configuration requires. Your motherboard manual may also specify a minimum recommended current, measured in amps, for the PSU's 12V connectors. Some manufacturers publish lists of power supplies that meet their components'

FORM FACTOR ATX Power supplies vary in depth, but their back panel always measures 150x85mm and has four screw holes in a set pattern

AC POWER SOCKET This accepts a standard kettle-type cable, which is usually supplied. Most PSUs automatically switch between 110V and 230V, but make sure you set any switch correctly

MOTHERBOARD POWER Modern PSUs supply the motherboard via a 24-pin connector, but older ATX motherboards use 20 pins. If necessary, check that your PSU comes with an adaptor or a detachable four-pin extension, as seen here

COOLING FAN Most power supplies have a cooling fan that makes a little noise; large 12cm fans are usually quieter

FAN MONITOR CABLE Some power supplies have a connector that allows the motherboard to monitor the PSU's fan for failure



demands. For example, nVidia's www.slizone.com website lists recommended PSUs for a dual graphics card SLI system.

Make sure you buy a PSU with the right connectors, as explained in our Compatibility Checklist. Count the number of devices in your PC

case that need Serial ATA (SATA), floppy and four-pin Molex power plugs. Check whether your graphics card or cards need power from a Molex, floppy or six-pin PCI-Express power connector. Don't forget to account for any further upgrades you are planning. Choose a power supply that

COMPATIBILITY CHECKLIST



BUY THE RIGHT PSU

Small PCs are usually built in a mini-ITX or Shuttle case, as shown above right. Each requires a special PSU, available only with a maximum output of around 300W. A full-size ATX power supply (above left) is far too big. If you're unsure which form factor you have, measure your existing power supply and compare the specs at www.formfactors.org. Make sure you buy a suitable power supply.

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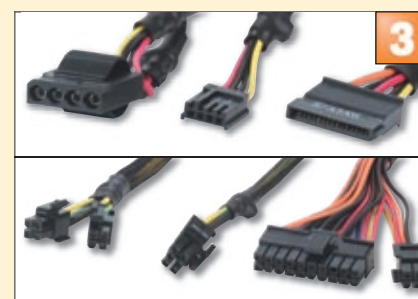
Power supply requirements

Components/Peripherals	Max	Load	Load
AMD K8 939er CPU type	Atxom 64 12V 15	Atxom 64 12V 15	Atxom 64 12V 15
PCIe x16 graphics card	6800GT Ultra x2	6800GT x2	6800GT x2
DDR 6600s	4	2	2
HD	4	2	2
Optical drive (DVD/CD-RW)	2	2	2
PCIe x1 card	1	0	0
PCI cards	1	2	1
IDE 1334 devices	1	0	0
USB devices	6	4	1
Required +12V current	> 25A	> 20A	> 17A
Required wattage	>= 500W	>= 400W	>= 350W

POWER REQUIREMENTS

If you have a puny PSU your system may be unstable, but an over-specified one will be a waste of money. Check your motherboard manual for advice. If you're about to buy a new motherboard, you should find its manual on the manufacturer's website. As a general guide, only very highly specified computers need more than 550W, and 400W should be more than enough for a typical PC.

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KNOW YOUR CONNECTORS

The picture above shows all the common power connectors. Clockwise from top left, they are four-pin Molex (for optical disc drives and hard disks), floppy disk drive, SATA (hard disks), 20/24-pin ATX (motherboard), six-pin PCI-E (graphics card) and four/eight-pin 12V (motherboard). Buy a PSU with enough for your existing devices, plus a couple of spare Molex or SATA plugs for future upgrades.

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exceeds your system's needs by 50-100W, and you'll be ready for any future expansion.

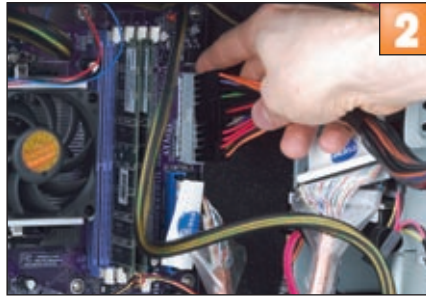
Most importantly, make sure you buy a PSU with the correct connections for your motherboard, as explained in our diagram (left). Modern motherboards have a 20 or 24-pin power connector. Most also require an additional 12V feed. This is usually provided by a four-pin plug, but some new boards need an eight-pin connector.

INSTALLATION

Once you've found the right PSU, fitting it is easy. Unplug your PC and remove its cover, referring to the manual for instructions if needed. You shouldn't have to touch any static-sensitive components, but it's a good idea to touch the unpainted part of a radiator periodically to discharge any static electricity that has built up.

1 REMOVE THE OLD PSU Begin by carefully removing all the power connectors from the disk drives in your PC. Follow the length of each wire on your existing PSU, unplugging each connector as you find it. Use tin-snips to cut off cable-ties if necessary, but be careful not to cut any fingers or cables by mistake.

Pull connectors directly away from their socket by holding the plastic plug itself, not the wires. Gentle movement from side to side may help free a stubborn Molex plug, but wiggling up and down could damage the circuit board on a disk drive.



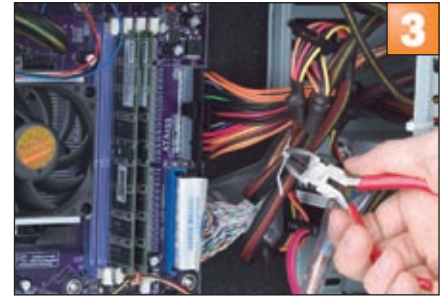
Untangle each freed bunch of wires and move it to one side. Release the large motherboard ATX connector by pressing in its catch. If necessary, remove the 12V plug and the fan monitor cable. Disconnect any power connectors from your graphics card.

Once all the power cables are free, remove the four screws holding the PSU in place. If your case uses a mounting plate, be sure to remove the right ones; use the position of the screw holes on your new supply as a guide. Take care to support your power supply; don't let it fall on to your motherboard.

In some cases, it's easy to extract the power supply towards the bottom. In other cases, you may need to slide the PSU forwards and rotate it free, as shown above. This may take a little force. Just make sure that a suddenly freed PSU doesn't strike fragile components in your PC.

2 FIT THE NEW PSU Most power supplies have a large air intake that should point down towards the computer's processor. Before fitting a PSU, check that its screw holes line up with those on the PC's mounting plate; you may need to remove the plate and rotate it first.

Fitting the new power supply should be the reverse of removing the old one. In some cases, you



may have to twist the PSU between any guide rails, applying a little force if necessary. Be patient if this proves tricky. With the power supply slid into place, fit four screws to hold it securely. Connect the four- or eight-pin 12V plug and the 20- or 24-pin ATX plug to the motherboard using any necessary adaptors. Press each firmly until it clicks into place. Some motherboards require a further Molex connection as well. Connect a power lead to your graphics card if required.

If your PSU has a voltage switch, check that it is set to between 230V and 240V. Make sure no fans are obstructed, then plug in an AC power lead. On most motherboards, a glowing LED indicates that the motherboard has power; otherwise, switch on your PC and check that the processor fan starts.

Remove the power cable again before connecting all the remaining devices in your PC.

TOP TIP

Removing a reluctant Molex plug can hurt the skin on your fingers. Protect yourself by grabbing the connector firmly through a dry tea towel.

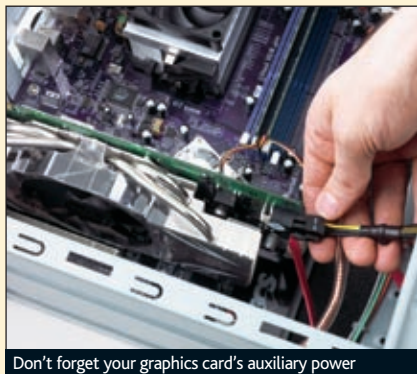
3 TIDY UP It's worth spending a few minutes to tidy up your handiwork before closing your PC's case. Bunch together any unused wires and use cable ties to hold them neatly to the

inside of an empty drive bay. Use a few other ties to gather stray wires together in neat groups. Don't go overboard as you may need to make room for any devices you add in the future. Be careful not to damage any wires with overly tight cable ties. **ES**

TESTING AND TROUBLESHOOTING

If your previous power supply didn't provide enough power for your system, a more powerful one should make your computer stable again. If you bought a new PSU to keep pace with other upgrades, fit them and check that it can cope.

Give your PC a thorough workout with a taxing 3D game or a benchmarking program. Try running PCMark04 from www.futuremark.com.



Don't forget your graphics card's auxiliary power

Some PSUs designed for overclockers come with a power gauge. This shows the load the power supply is under. Fitting this is usually optional, but it can provide useful feedback in a highly specified system.

After your computer has been running for an hour or so, check the case isn't too hot. A modern PSU automatically adjusts its fan speed to suit its temperature, so it might not extract as much hot air from the PC case as an older, noisier supply. Even if you can't hear the PSU fan, you should be able to feel warm air blowing from the back vents. If your computer feels very hot, consider fitting a rear case fan to draw more air out. We'd strongly recommend this if you have a fanless PSU.

Any major problems should be easy to spot. If you forgot to connect any drives or other devices your computer may not boot into Windows, or you might find some devices are no longer available.

■ If your motherboard's power LED doesn't light, check in the manual that you have made the right

power connections. If your old PSU failed, it may have blown the fuse in its mains lead: use the one supplied with your new PSU or test the old one with your monitor or another device.

■ If your computer sounds a warning beep, power it off and double-check that you've connected any extra power to the graphics card. Check your motherboard connections, too.

■ If your computer refuses to start Windows or throws up any disk warning errors, make sure you have connected power to all your disks. If a SATA hard disk has both a SATA and Molex power socket, check you didn't connect both.

■ Some motherboards may display a fan speed error that halts bootup. Check you connected the fan monitor cable if your new PSU has one. If not, or if your PSU has a variable speed fan, you may need to enter the BIOS to disable monitoring of the power fan. Refer to your motherboard manual for guidance.